RECEIVED
FEB 2 9 1904

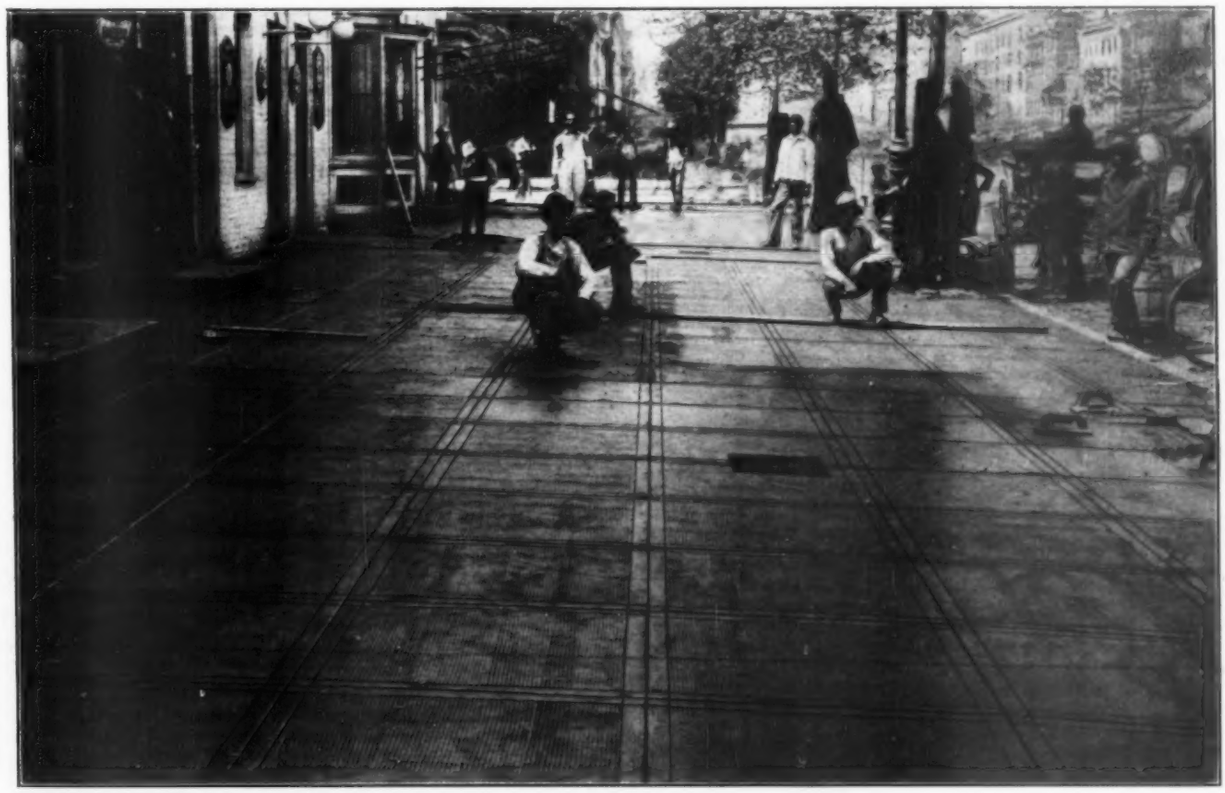
POPULAR MECHANICS

An Illustrated Weekly Review of the Mechanical Press of the World

"Tells you how to do things" Written so you can understand it

Vol. 4. No. 3. CHICAGO, JULY 18, 1903. PRICE 5 CENTS.

Building the World's Finest Walk at Washington



First Active Work Resulting From the Decision to Make America's Capital the Most Beautiful City on the Globe

IN THIS ISSUE:

Washington, the World's Most Beautiful City.
Students Serve as Human Electric Wires.
Clean Linen Schools in Modern Laundries.
Easy Electrical Experiments—How to Make an Induction Coil.
Fortunes in Mexican Bananas.
History of the American Cabinet Organ—Part III.
The Windiest Place on Earth.
To Widen Cuba's Sidewalks.
Spraying Trees by Machinery.
How to Build a Small Steam Engine.
Home-Made Automobiles, the Raging Fad.
New Self-Operating Fire Escape.
Steel Cars in a Wreck.
Shop Notes:—How to Splice a Rope Drive—How to Remove a Broken Spoke—How to Test Mercury—Handy Grinding and Polishing Machine—Mud in Boilers.
Burning Screenings.
Mechanics on the Farm—Part I.
Wireless Telegraphy in Commerce.
The Plant That Grows Buttons.
Sleeping Cars on Trolley Lines.
Gas For Killing Cats.
Demonstrates Ozone Process.
Passing of the Sailing Vessel on the Lakes.

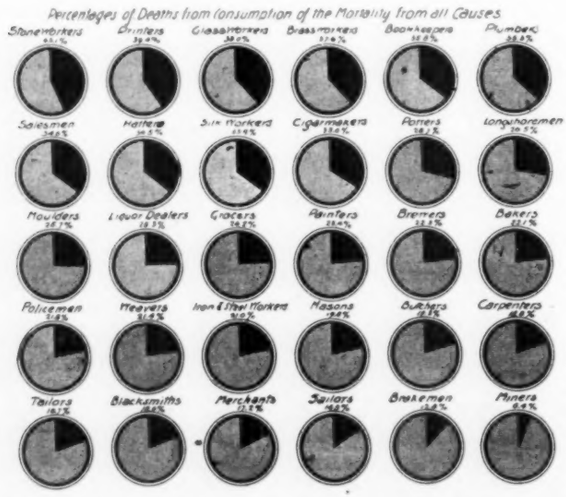
Washington--The World's Most Beautiful City

Work Now in Progress to Make America's Capital a Dream of Artistic Grandeur

In the work of "making Washington the most beautiful city in the world" one of the first steps has been the overhauling of the sidewalks and replacing them with magnificent Old Dominion Portland cement walks of splendid dimensions and artistic construction. The walks now being built are almost as wide as an ordinary street and are the finest in existence. The effects of this improvement have been most pleasing in the districts where the work is completed, and has led to the conclusion among architects that nothing adds more to the artistic appearance of a city than wide sidewalks. More than 24,000 barrels of Portland cement have been used in the last few months in this work alone, and congress has sanctioned appropriations amounting to $36,000,000 for additional improvements. The Union railroad terminal will add greatly to the city's appearance and it is said will be the handsomest building of the kind in the world. It may be said that Washington is being rebuilt. Everywhere the work of improvement may be noted—in the park system, the government buildings, the streets, sidewalks, residence and business houses. The finest architects in the country have been employed in planning the important work which will require many years to complete.

INDUSTRIAL WORKERS AND CONSUMPTION.

A life insurance man who has been making some investigations has prepared a chart which shows the relative percentage of deaths from consumption in a number of the well



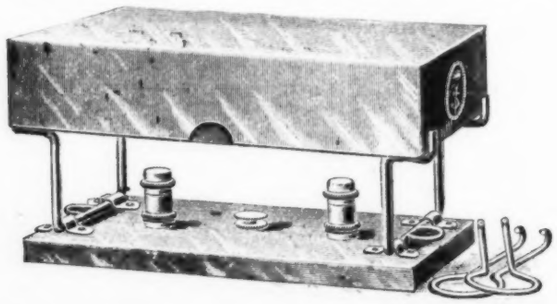
known trades and occupations. This chart appeared in the Mill Owner and is reproduced here. It is self explanatory, the records covering a period of two years.

The best non-conducting pipe covering is that which contains the greatest number of individual air cells or dead-air spaces in its composition, for stagnant air, or air without the least circulation is the best non-conductor known.

An overhead railroad of the Ebberfeld suspension type is projected for London by a Syndicate of American, German and English financiers.

POCKET STERILIZER FOR SURGEONS.

The great success of modern surgery is not so much in the greater skill of the operator, as in the fact that he has antiseptics and means of sterilizing his instruments which were unknown a decade ago. Where an operation can be done in a hospital all the necessary appliances are at hand. The advantages of these means are seen in the hospital cars which many railroads have built, in which fully equipped



operating rooms are provided. But in country practice and emergency work these advantages are absent. To provide a portable sterilizing instrument a New York surgeon, Dr. W. P. Herrick, has invented something which can be taken apart and packed in small space. When set up it affords a sterilizing tray, with cover, which is heated by an alcohol lamp as shown in the illustration.

American capitalists are to furnish Paris with gas. The Parisians became tired of paying an equivalent of 75 cents a thousand and so the Americans are to furnish it for 50 cents, about half what is paid in American cities.

The first long-distance passenger car service has been established in South Africa between Mafeking and Potchefstroom, a distance of 100 miles. It is the object to build the line on to connect Mafeking with Johannesburg.

FREE TO POPULAR MECHANICS READERS.

Everything there is to a telephone is tersely described and illustrated in a new and handsome booklet just issued by the Acme Electric Company, 200 South Clinton street, Chicago. It shows all the latest devices in telephone and switchboard apparatus, and tells of their uses, construction and connections. So simple and intelligible is the work that any person of ordinary intelligence can build a simple telephone line after having read it. The booklet concludes with interesting chapters on "Materials to be Used in Line Construction," "Installing Bridging Telephones," and "Telephone Troubles and How to Find Them." The booklet is something that every person who has anything to do with a telephone, especially lines in small towns and the country, will find very instructive and entertaining. By special arrangement the Acme company has agreed to send a copy of the work free to every person who will mention Popular Mechanics in the request.

DESIRABLE ARTICLE TO MANUFACTURE.

A rural letter carrier has sent us a metal flag which can be changed in an instant to display any one of the weather signals adopted by the government. The indications are that all of the 25,000 rural letter carriers will be compelled to carry these signals on their wagons within a year or two. The inventor desires to correspond with some good manufacturer with a view to pushing the matter. We shall be glad to forward any inquiries from manufacturers who desire to look into the matter.

DEVICE TO PREVENT TUGS FROM SMOKING.

A device to prevent tugs from smoking, the invention of William Summers, is being tried on the Chicago river. It consists in an arrangement of steampipe which throws 18 jets of steam into two inside stacks within the funnel of the boat. These are supplied by a draft of hot air passing through the firebox into the jets. By this means temperatures are produced which render the smoke combustible. Four holes about 1 inch in diameter in the boiler doors admit cold air in moderate quantities. This diminution in the amount of cold air usually used will, it is expected, prevent the crystalizing of of the tug's boilers, a drawback which has hitherto been found difficult to overcome in smoke consuming devices used on steamers.

Students Serve as Human Electric Wires

500,000 Volt Current Passing Through Them Lights Lamps and Does Not Harm

Two University Michigan students stood in a darkened laboratory last week, holding an electric light bulb between them like a water pail. A college professor pulled a lever. The electric bulb suddenly lighted the room, showing an audience who gazed in amazement at a human electric wire --the arms of the two students through whom the current ran. The students grinned sheepishly at the startled looks of the audience.

Then the professor, Benjamin F. Bailey, stepped forward, and by the light of his human wire demonstrated how a 500,000 volt current of electricity may be made as harmless and agreeable as a June breeze. Indeed, the two students nodded when he stated, as his first remark, that the only sensation which the boys experienced was a warm tingling of the palms of the hands.

The scientist explained the appartus through which so strong a current of electricity was made harmless. It was a "step up" transformer. Roughly described, this transformer was a box two feet long, one foot high, and one foot wide, filled with oil. Immersed in the oil were two coils of heavy wire, one of four turns and one of 200. The voltage of the current in the small coil was increased thousands of times in passing through the larger coil.

The electric current used came directly from the university dynamo, with 15 amperes and 110 volts strength. It passed through two "step up" transformers, the first one raising it to 5,000 volts, a current destructive to human life. Then it was run directly into the odd transformer described. Just what influence the oil exerted over the electric fluid was not explained. The effect, however, was tremendous. The fatal current had 240 alternations a second; this new current, 800,000 alternations. The current had been transformed from 5,000 to 500,000 volts, and was now harmless. There are two theories in explanation of the harmlessness of this current. According to one, it alternates with such extreme rapidity that the electricity has no time to act on the muscles, nor to communicate its impulses to the nerves. The other theory holds that the current does not enter the body at all, but passes over the outside.

The medical value of the strong current has been tested at the University of Michigan hospital by Dr. W. J. Herdman. It has been found to induce sleep, under proper conditions, and to benefit rheumatism.

Clean Linen Schools in Modern Laundries

Old-Time Custom Revived and Proved Most Beneficial in Late-Day Laundries

The old-time system of laundry inspection by the managers and heads of departments that prevailed 16 years ago has been revived and is now called the "clean linen school." It is an important feature of the most modern laundries of to-day. The manager and forewomen assemble about a large table where the laundry work is laid out and inspected. The best daundered article is taken as a standard and the methods by which it was produced discussed and studied, the effort being to make all the other work equal this standard. As a result the standard becomes higher all the time and the general superiority of the work proportionately increases. The illustration shows a laundry class of 16 years ago, which the National Laundry Journal says is almost identical with the ones of to-day. It will be noted that even the clothes worn by those in attendance is not so very different from modern styles.

Laundry Employes at Clean Linen School

A. Leschen & Sons Rope Company, manufacturers of wire rope and aerial wire rope tramways, have moved their San Francisco office to the Rialto building, corner of New Montgomery and Mission streets, San Francisco. Their other offices remain as heretofore, namely: Home office, No. 920-922 North First street, St. Louis, Mo.; No. 137 East Lake street, Chicago, Ill.; No. 92 Centre street, New York, N. Y.; No. 1717-1723 Arapahoe street, Denver, Colo.

FORTUNES IN MEXICAN BANANAS.

Land of Mexico's Finest Climate and Fairest Women—Fruit in Great Demand.

Growing interest in the banana trade of Mexico probably means additional fortunes for Americans who are interesting themselves in the industry. The banana tree seems to thrive there with slight cultivation to an extent that has surprised investors. Besides, the Tropical Truth says: "Demand in the United States for Mexican bananas is such that the crop is insufficient. Purchasing agents in the states of Veracruz, Morcelos, Nueva Leon and Jalisco are buying entire crops and contracting for future productions."

Banana Grove in Mexico—Native "Senora" in Foreground

lands where the bananas grow is considered the most picturesque and healthful of Mexico. Here the natives have developed a higher degree of civilization than can be found in other rural sections of the country. The women are fairer and are more adept with the needle. A typical Mexican banana grove is shown in the accompanying illustration. The native "senora," in the foreground is wearing an embroidered garment made by her own hands.

FIXING TUBES IN A TUBE PLATE.

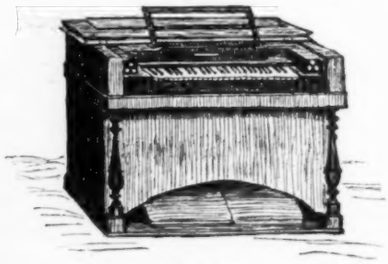
Tests made some time ago with water-tube boilers having tubes 3 ins. in diameter showed that when the tube was simply expanded into the tube-plate it required a force of 6,300 lbs. to withdraw it, while if the tube was expanded and then flared a pull of 19,700 lbs. was required. From this it is calculated that with 4-in. tubes and a boiler pressure of 200 lbs. per square inch, the factor of safety of the attachment of the tubes to the plate is only about 2½ when the tubes are simply expanded, and is 7.8 when the tubes are flared.

HISTORY OF THE AMERICAN CABINET ORGAN—PART III.

Many Brilliant Inventions Leading to the Liszt, the Greatest Wind Instrument of the Day.

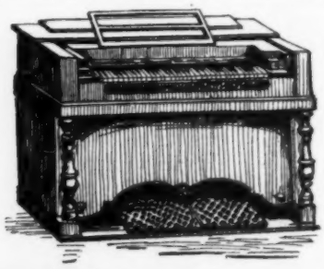
By Henry Lowell Mason, Contributor to The Presto.

In 1850 a brilliant mechanic in the factory of Prince & Co., Buffalo, Emmons Hamlin by name, made discoveries which revolutionized and well-nigh perfected the art of voicing reeds. A given reed could now be made to imitate a clarinet, an oboe, a violin, or other instrument, by voicing, while up to this time a prevalent cry against all those reed instruments had been that they were monotonous.



Harmonium

And so in 1855 there appeared a new instrument, organ-harmonium, invented by Mason & Hamlin, the Hamlin being this same Emmons Hamlin. A double bellows was introduced, insuring not only a round, full tone of much greater volume, but a capacity for varied expression.



Organ Harmonium

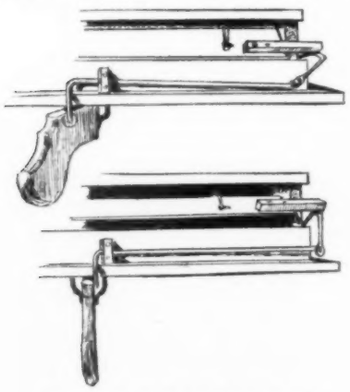
This new instrument rapidly gained the attention and approval of organists, and its reputation became so general and the demand for it so large that other manufacturers adopted its name—applying it to instruments of totally different construction. In order to individualize their instruments from inferior ones of other makers it became necessary to coin a new name—and the name Cabinet Organ was introduced by Mason & Hamlin in 1861.

Foot Blow Pedals

Thus the organ-harmonium became the cabinet organ. The word cabinet was chosen naturally enough, for the instrument was now made with a case or cabinet, taking up no more floor space, how-

ever, than the melodeon had done, but inclosing all the space taken.

Mr. George Woods, a foreman in the Mason & Hamlin factory, introduced, in 1862, the automatic bellows swell—by which device the swell was self-acting, opening or closing without the aid of a separate pedal or stop operated by the

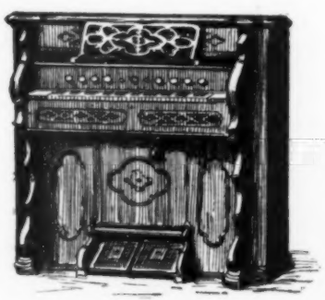


Knee Swell—In Use and Not In Use

player's foot or hand. An important improvement was later introduced by Mason & Hamlin known as the knee swell, today universally used. Both the automatic swell and the knee swell operate so gradaually and so evenly that they produce most perfect crescendos and diminuendos, an immense advantage over the ill-working swell of the melodeon.

Thus it is apparent that a vast and interesting variety of tonal effects, of expression, and of power, became possible in the cabinet organ. The instrument has been gradually developed and perfected, many makers contributing to this end, to the culmination as found in the Liszt organ—really an instrument of its own class.

We have seen that the first and earli-



Cabinet Organ.

est member of this family of instruments was the Bibel-Regal—and we have endeavored to trace step by step the successive instruments history has borne to the family, and is it not with a certain undeniable as well as a national enthusiasm that we are assured that the highest point—the ultima thule—of wind instruments played by means of keyboard has been achieved in the American cabinet organ?

The automatic telephone system which is soon to be installed in Chicago will do away entirely with the telephone girl. The phoner connects with the phonee by a device purely mechanical and automatic.

The Windiest Place on Earth

Breezes Blew the Cups From the Weather Bureau Aerometer at Point Reyes, California

Point Reyes, Cal., is the windiest place on earth. The wind blew so hard there a short time ago that it ripped the cups from the anemometer of the weather bureau. The weather tower there is almost continuously in a hurricane. The storm signal station had to be built stronger than any other to keep it from being blown down. People in visiting Point Reyes have to walk on the leeward side of rocks so as to shelter themselves from the wind or risk being blown away. For two years in succession the Point Reyes weather station has captured the world's record for swift winds. The wind currents about the Masonic Temple in Chicago and the Flatiron in New York that raise hats and umbrellas to the top of skyscrapers would be considered but gentle zephyrs at Point Reyes. Here the wind sometimes attains a speed of 120 miles an hour. For three whole days in succession not long ago it blew at the rate of 102 miles an hour. Sixty miles an hour is considered very calm weather.

Point Reyes is thirty-five miles north of San Francisco. Its principal possessions are the United States light station and the United States weather bureau and storm signal station. The stations stand on a rugged promontory 600 feet high. Perched on the crest of the promontory are the government signal stations. Professor McAdie, chief of the United States weather bureau at San Francisco has caused the records of the Point Reyes station to be photographed for exhibition at the St. Louis world's fair.

Where the Wind Blows 120 Miles an Hour.

TO WIDEN CUBA'S SIDEWALKS.

Are Now So Narrow that Two People Cannot Walk Abreast

A movement has been started among the Americans in Cuba to do away with the narrow sidewalks in the cities of the island. Puerto Principe, a city of about 15,000 inhabitants, in the province of the same name, is to be the first place on the island, it is said, to have wide walks. In Cuba the sidewalks seem to have been built principally with a view of preventing the vehicles from rubbing against the buildings and not at all for the accommodation of pedestrians. Two persons can scarcely walk abreast on them and people generally traverse the streets Indian fashion.

Cisneras Street, Puerto Principe, Cuba.

Popular Mechanics

"Written So You Can Understand It"

PUBLISHED BY POPULAR MECHANICS CO.
JOURNAL BUILDING .. .. CHICAGO

H. H. WINDSOR, President
R. R. RUTHERFORD, Sec'y H. A. HESS, Treas.

SUBSCRIPTION

United States, Canada, Mexico and all U. S. Possessions, per year $2 00
Foreign Countries, post paid 3 00

Subscribers are requested to give 10 days' notice in advance when change of address is desired. Doing this will insure their receiving the paper without interruption. Be sure to give old address as well as new.

Advertising forms will close Tuesday at 5 p. m. for issue dated Saturday of the following week. Advertisers are invited to examine our books at any time.

Make Remittances by Draft, Money Order, or Registered Letter. Address

POPULAR MECHANICS
Journal Building .. .. Chicago

Entered at the Chicago Postoffice as Mail Matter of the Second Class.

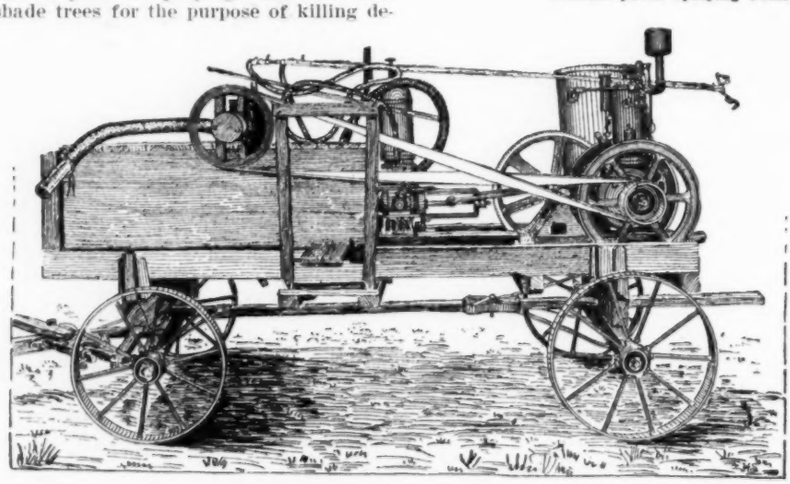
LONG DISTANCE TELEPHONE MAIN 2682

SPRAYING TREES BY MACHINERY.

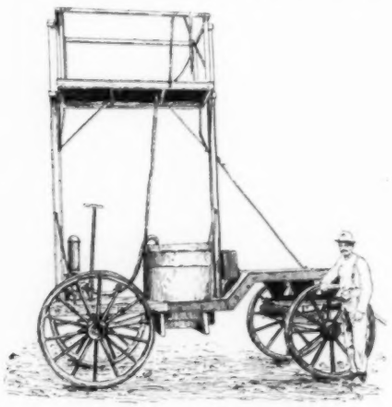
The Department of Agriculture devotes a very interesting bulletin (No. 171) to the subject of spraying orchard and shade trees for the purpose of killing destructive moths and other insects. Two methods are recommended, one the hand sprayer and the other operated by a gasoline engine.

In the first named an air pump is worked by hand, by means of which three men can spray 250 average sized trees in one day. The power machine operates on the same plan, except that the air compressor is driven by a gasoline engine, and 700 eight-year-old trees can be sprayed in 10 hours. The tank contains 150 gallons of mixture. Such an outfit may be had for $320, including a $40 wagon.

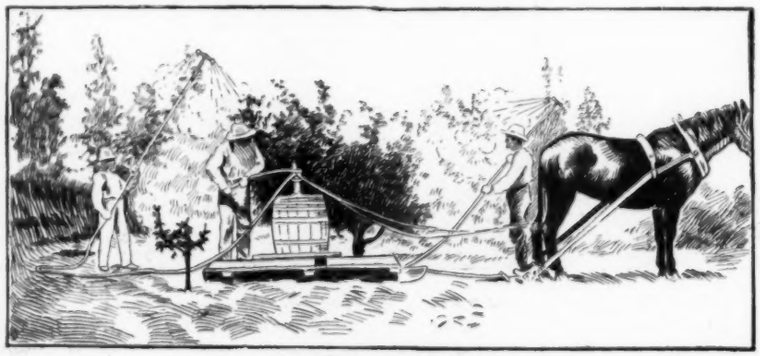
The engine is of one horsepower and will run 10 hours on one gallon of gasoline. The same engine can be used for other purposes such as sawing wood, churning, and cutting feed.



Gasoline Power Spray Outfit



Spraying Outfit for Reaching Tall Trees

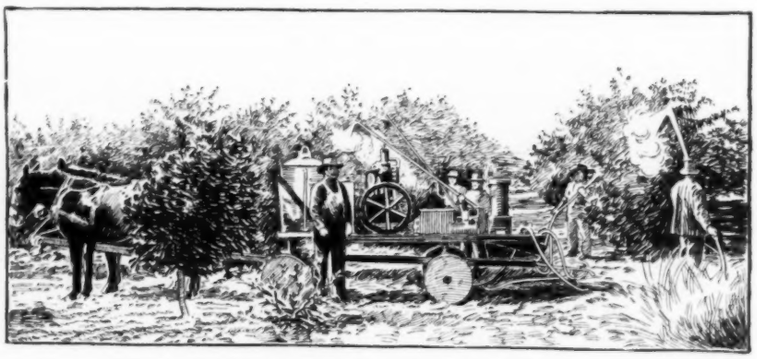


Hand Pump Spraying Device

How to Build a Small Steam Engine

Anyone who has a slight knowledge of the use of tools can now build a steam engine. The work presents a most useful and instructive pastime and when completed the maker has something valuable. In order to encourage our readers in the undertaking Popular Mechanics had made to order a complete set of all the castings and parts necessary to construct a 1-horse-power horizontal steam engine. The cylinder is bored and the guides milled and planed. The assembling and tool work can easily be done with the tools to be found everywhere.

All castings and parts with full instructions will be given free for a club of new subscribers, which ought to be secured in any town in a single Saturday afternoon. Write us for full particulars.



Gasoline-power Spraying Outfit with Four Lines of Hose in Operation

COTTON IN FRENCH COLONIES.

An association has recently been formed by a group of French merchants and spinners for the study and development of the culture of cotton in the French colonies, particularly in Africa. The grounds for this action are stated by the promoters to be, among others, the tendency of the United States to create monopolies, and the speculative character of the cotton business in that country. Reference is made in the prospectus to the efforts of the United Kingdom to encourage the growing of cotton in Egypt and India, and to a German society for promoting cultivation of cotton in Togoland and other German colonies.

"HOME-MADE" AUTOMOBILES THE RAGING FAD.

Not Hard to Build. All Parts Can be Bought Separately, and the Enjoyment in Its Possession are Tenfold

Why not make your own automobile? It is not difficult; it is much cheaper; you can make it any size or design you fancy, and when completed you have the ten-fold satisfaction of viewing and enjoying the pleasures of a construction

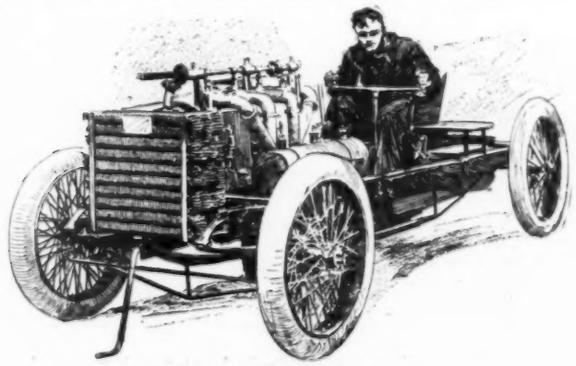
A "Home-Made" Automobile

that you know is entirely the product of your own mechanism. "Home-made" automobiles are now all the fad. Popular Mechanics told in a previous issue of a boy who made a motor car in its entirety, the machine being just large enough to accommodate the boy and his sweetheart. Those who have not the facilities for making all the parts necessary to a first class machine, can now buy them separately. An establishment—the Automobile Supply Co., 2108 Olive street, St. Louis,—will sell any or all parts for any design of automobile the amateur builder may desire and ship them to any address.

The illustration shows a home-made automobile built by H. C. Colburn of Victor, Col. It is called a Louisine. It is not a Volturette, nor a heavy touring car, but something of a combination of both and a type not uncommon in France. It is sufficiently low, graceful, and light, weighing about 1,300 pounds. All the parts for the machine were bought from the Dyke company. It has gravity circulation, doing away entirely with the circulation pump. The running gear is made with half elliptic springs, front and rear. A remarkable feature of the machine is its lamp, which is made to shift, by lever from the seat and can be raised or turned at any angle or radius, like a search light on a war vessel. It has numerous other conveniences such as its maker desired.

LOWERS AMERICA'S TRACK RECORD.

Barney Oldfield at the recent automobile races in Indianapolis lowered the American track record, clipping two sec-



Oldfield in His Newest Racer

onds off the one mile record and 23 2-5ths off the five mile record. The mile was run in 59 3-5ths seconds and the five miles in 5 minutes and 28 seconds. The previous American records were 1: 1 3-5 for the mile and 5:28 for the 5 miles. Oldfield performed the feat in a contest with Tom Cooper. The performance was witnessed by 5,000 cheering spectators.

MAKES ESCAPE FROM FIRES EASY.

New Patent Device Appears in Chicago That Will Re ult in Saving Many Lives

Escaping from a fire in a flat building or hotel is made as easy and simple as swinging in a swing by a new device that has just been patented and placed on the market in Chicago. It is a mechanical contrivance, that is light, always ready and cannot get out of order. Had the inventor conceived the idea sooner it might have been the means of saving many lives lost through the need of just such a contrivance. Its field of usefulness for the future, however, is without limit. All a person has to do in escaping from a burning building is to slip the end of the rope over any solid projection, sit in a swing and ride down at any speed he desires and with the speed always under perfect and easy control. The device is known as the O. & L. reversible fire escape, deriving its name from Orr & Lockett, the well-known Chicago hardware firm,

Rescuing Herself From Fire

who placed it on the market. A woman or child can operate it as well as a man. The illustration is from a photograph of a woman descending in the escape showing the manner of its operation.

The last link of the commercial Pacific cable has been laid between San Francisco and Manila and the United States now has direct communication with its Philippine possessions.

The Australian telegraph authorities have pronounced against the adoption of the Marconi wireless system on the plea that the currents are uncontrollable and messages are liable to interception.

EASY ELECTRICAL EXPERIMENTS

By L. P. Dickinson

HOW TO MAKE AN INDUCTION COIL.

In the previous chapter directions were given for the construction of the primary of our coil. The secondary will next receive our attention. The primary consists of a comparatively few turns of coarse wire, while the secondary consists of a very great number of turns of fine wire. Each turn of the secondary has generated within it an electromotive force,

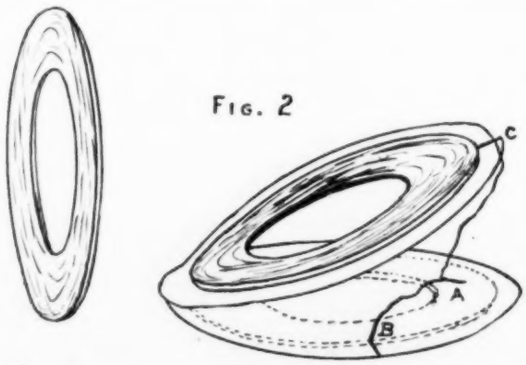


Fig. 2

and as the latter must be very high, this necessitates a large number of turns.

The secondary cannot be wound in one large continuous coil. If we did this, the electromotive force would be so great as to strike through the silk insulation upon the wire, rendering the coil inoperative. The coil is made up of a number of disk-like sections such as is shown at the left in Fig. 2. The sections are placed side by side, with insulating material between them, and each section is connected in series with the next, so that the effect is the same as if the coil were wound in the ordinary manner.

In order to wind the sections a special winder will be required. A suggestion as to the method of construction is given in Fig. 3. A and B are two circular pieces of wood, 3¼ inches in diameter. Between them is another circular piece 1⅝ inches in diameter and 3-16 inch thick. The three pieces are tightly screwed together, with their centers coincident. The inner faces of A and B, and of the center piece, must be smooth and true, so that when the screws are tightened up the three pieces will fit perfectly together. They are to be mounted upon a shaft supported in suitable bearings and provided with a crank, so that wire may be wound upon the central portion. The disc A may fit loosely upon the shaft, but B should fit tightly so as to turn with the shaft. For this reason B should be rather thick and should preferably be of hard wood. The disc in the cutter should be tapered, the smaller end being next to A, so as to permit the coil, after it is wound, to be easily removed.

Having made this rather crude winding device, we are

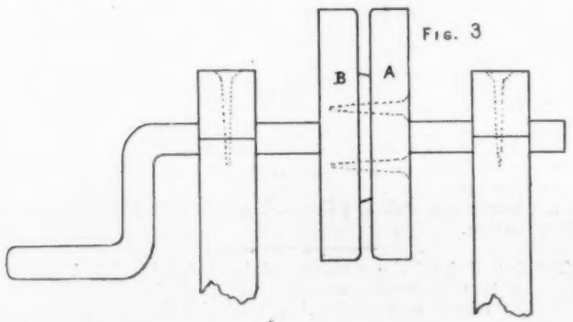


Fig. 3

ready to wind the sections of the coil. For this purpose we shall need about 6 pounds of No. 34 single silk covered magnet wire. Each small section consists of 1,500 turns, wound as tightly and as evenly as possible.

In winding, support the spool upon which the wire is bought in some convenient place, and arrange it so that the wire, in passing from this spool to the winder, shall dip into a dish containing melted paraffine wax. This can be done by using a rather deep dish for melting the wax, with a spool immersed in the melted wax, under which the wire runs in passing to the winder.

Using the apparatus shown in Fig. 3, wind eight sections, each having 1,500 turns. Each section as it is wound can be carefully removed from the winder without damaging the turns of wire. To prevent the coil from sticking to A and B, two thin disks of paper may be placed against the inner faces of the pieces, and may be lightly glued to A and B at three or four points around the edge.

After each section is removed wrap a strip of thin tissue paper around the coil at three or four points, fastening the strip by a bit of wax to prevent the coil from unwinding or losing its shape.

Having made eight sections of the dimensions given above, remove the disc in the center and substitute therefor another disc two inches in diameter and slightly tapered as before. This will make a section with a larger hole in the center, but exactly like the preceding in general shape. Then make 18 of these sections, each section being of 1,000 turns.

We will continue our discussion in the following chapter.

ITALY'S THIRD-RAIL ELECTRIC ROAD.

The Electrical Review prints an article on the first third-rail electric railway in Italy. The road runs from Milan to Varese and Porto Ceresio and is forty-six miles in length.

The electric energy for this railway system is furnished by a central station in the form of three-phase current at 13,000 volts, and is transformed in substations into continuous current at 650 volts, and supplied to the cars by a lateral third rail.

The central energy station is located on the left bank of the Tessin river, where a hydraulic plant will be arranged to furnish the electrical energy by water-power. At present a steam plant is used, and this will be also used later as a reserve to insure service should interruptions occur at the hydraulic station.

Five transformer substations are located on the road, at distances of ten miles apart. In three of these substations the high-tension current passes through double high-potential bus-bars and two oil circuit-breakers, and is carried either toward the primary of the transformers or toward the starting compensator, if it is necessary to start the rotary converters from the alternating-current side. In each of the three substations mentioned above there are seven static transformers with forced ventilation, one of these being held in reserve. These are for twenty-five cycles, having a capacity of 180 kilowatts each, and lowering the potential from 12,000 to 420 volts. From the secondary of the transformers, current passes to the rotary converters and is transformed into continuous current at 650 volts. The current furnished by the rotary converters, after passing through the switchboard, is supplied by insulated cables to the service conductor or third rail, which is at the side of the track and raised seven and one-half inches.

The rolling stock of the road consists of twenty motor cars and as many trailers. The cars are divided into compartments, and each motor car will carry, all told, seventy-five passengers and each trailer ninety passengers. The motor car has four geared motors of the type G. E. 55 H, of seventy-five horse power, but can develop for one hour 160 horse power without exceeding seventy-five degrees above the temperature of the surrounding air. They can operate in series or in parallel, and have been designed to give the high speed of sixty miles per hour, and for rapid starting necessitated by frequent stops.

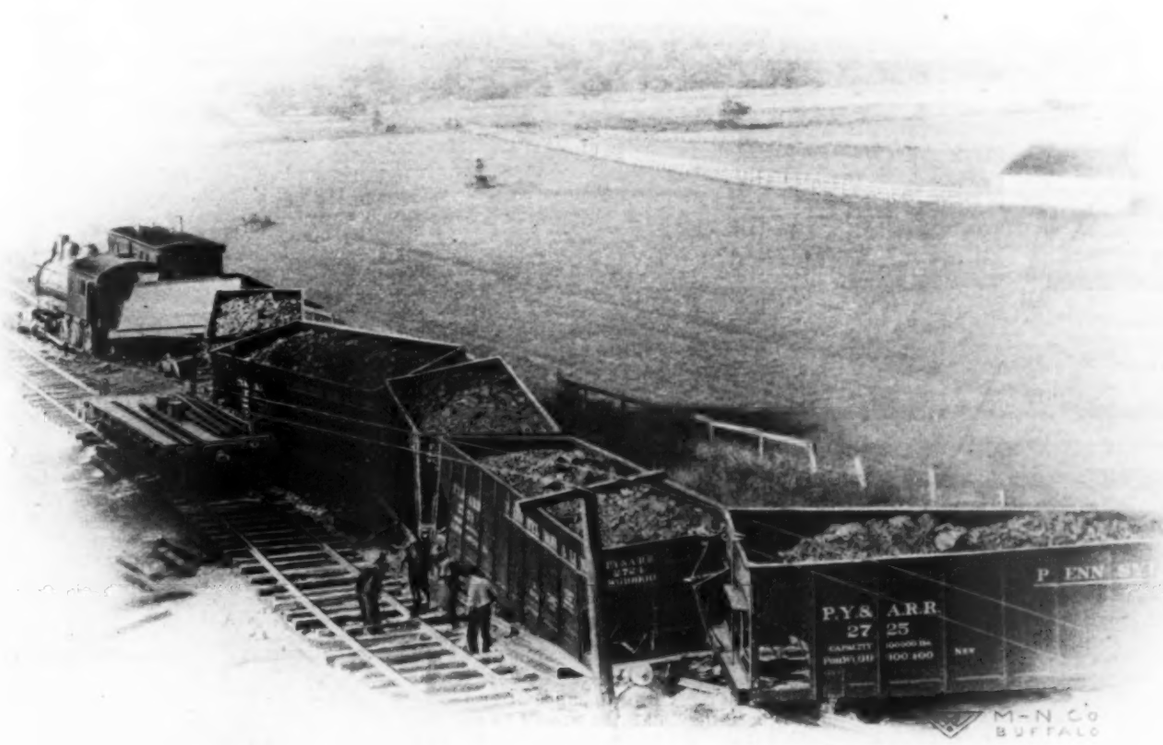
Albert Larkum, a lineman weighing 250 pounds, fell from a telephone pole at Hartford, Conn., striking Mrs. Charles Edwards, wife of Professor Edwards of Trinity College, Mrs. Mary E. Brewster of Minneapolis and her 11-year-old daughter, who were standing beneath the pole. The two women were badly injured, both the little girl's arms were broken and Larkum may die.

The provision officials of Prussia have petitioned to have eggs sold by weight instead of number, because it is found that German eggs are so much more than imported eggs.

STEEL CARS IN A WRECK

Hurled Promiscuously Along the Track, Track Torn Up, But They are Uninjured

The coming of the freight and passenger trains of all-steel cars was heralded by Popular Mechanics in previous issues when it was shown by illustration the superiority of capacity, and the locomotive left the track. The main track and the siding were badly torn up and the running gear, brake mechanism and other such attachments to the cars sustained considerable damage. The cars themselves, however, despite the fact that they were strewn pell mell along the track, were practically uninjured. They could not be moved until they were unloaded, when it was shown that their damage consisted only of a little skewing of the bodies.



Steel Cars in a Wreck on the P. Y. & A. R. R.

the steel cars over the wooden cars in wrecks. Here is another illustration that serves to show the same conclusion. The wreck was one on the Pennsylvania, caused by an open switch. Five pressed steel cars, each of 100,000 pounds' capacity, and the locomotive left the track. The main track and the siding were badly torn up and the running gear, brake mechanism and other such attachments to the cars sustained considerable damage. The cars themselves, however, despite the fact that they were strewn pell mell along the track, were practically uninjured. They could not be moved until they were unloaded, when it was shown that their damage consisted only of a little skewing of the bodies.

The great damage often caused by fires in the event of wrecks is also averted by the steel cars, which are made by the Pressed Steel Car Company. They are wonderfully strong throughout and have a great carrying capacity.

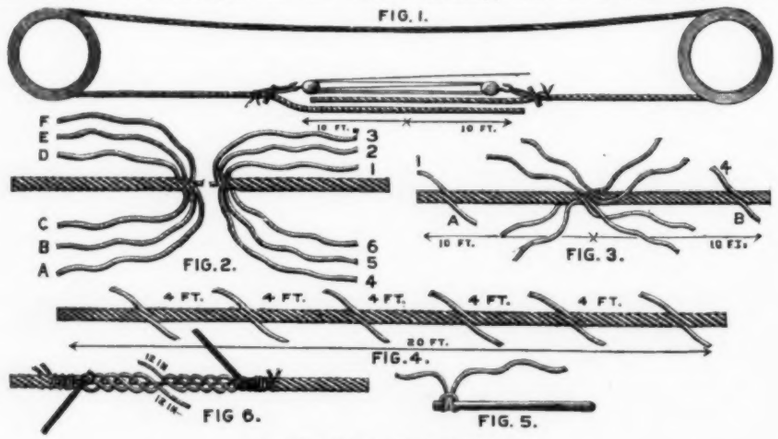
A Modern Train of Pressed Steel Hopper Cars

SHOP NOTES

HOW TO SPLICE A ROPE DRIVE.

In their latest, and extremely interesting, booklet on wire ropes, the A. Leschen & Sons Co., of St. Louis, tell how to splice a wire rope. This chapter is so instructive we publish it in full:

The splices for running rope are all of the kind known as the long splice, and should be put in 20 feet long. The diameter of the rope is not increased or diminished, or the strength of the rope



Showing Method of Splicing a Rope

perceptibly weakened by this splice, and after it has run for a day or two the locality of the splice can not be detected by the most careful examination.

In most cases the rope can be applied endless, and in such cases the rope can be forwarded spliced ready to go on. We can furnish ropes ready spliced by giving us the exact distance from center to center of shaft, and the exact diameter of the wheels on which the rope is to run. This measure can be gotten best by stretching a wire from shaft to shaft, marking the distance from center to center of shaft, and carefully measuring the wire.

In cases where the endless rope can not be put on, the rope has to be put around the sheaves, hove taut by pulley blocks, and the splices made on the spot. See Fig. 1 in diagram of splices.

Wire rope is susceptible of the most perfect splicing, a smoother and better splice can be put in wire rope than in any other kind of rope, for the simple reason that it is made with a view to this purpose. It has just the desired number of strands, namely, six, and a hemp core, which provides a place for fastening the ends. It is a plain, simple process, and but the work of an hour for any one to learn.

The necessary tools include a hammer and a sharp cold chisel for cutting off ends of strands; a steel point or marlin spike for opening strands; two pieces of heavy tarred marlin or thin rope with sticks; a pocket knife for cutting the hemp core; a wooden mallet and block. (See Fig. 5 for untwisting rope.)

First.—Put the rope around the sheaves and heave it tight with good block and fall. (See Fig. 1.) The blocks should be hitched far enough apart so as to give room between to make a 20-foot splice. A small clamp may be used to prevent the lashing from slipping on the ropes where the blocks are hitched. (See Fig. 1.) Next, see that the ropes overlap about 20 feet; about 10 feet each way from the center as shown by the dotted lines in Fig. 1. Next, mark the center of both ropes with a piece of chalk, or by tying on a small string. Now proceed to put in the splice, with the blocks remaining taut when it is necessary, but the better way is to remove the blocks, throw off the rope from the sheaves, let it hang loose on the shafts, and proceed with the splice on the ground or floor, or scaffold, as the case may be.

Second.—Unlay the strands of both ends of the rope for a distance of 10 feet, or to the center mark as shown in Fig. 2. Next cut off the hemp cores close up as shown in Fig. 2, and bring the bunches of strands together so that the opposite strands will interlock regularly with each other. (See Fig. 3.)

Third.—Unlay any strand, A, and follow up with one strand of the other end, laying it tightly in open groove made by unwinding A, make twist of the strand agree exactly with the twist of the open groove. Proceed with this until all but twelve inches of one are laid in, or till A has become ten feet long. Next, cut off A, leaving an end about twelve inches long.

Fourth.—Unlay a strand, 4, of the opposite end and follow with strand D, laying it in open groove as before, and treating this precisely as in the first case. (See Fig. 2.) Next, pursue the same course with B, and 2, stopping four feet short of the first set. Next, with 5 and E, stopping as before, then with C and 3; and lastly with 6 and F. The strands are now all laid in with ends four feet apart, as shown in Fig. 4.

Fifth and last.—The ends must now be secured without enlarging the diameter of the rope. Take two rope clamps (see Fig. 5), and fasten them to the rope as shown in Fig. 6; twist them in opposite directions, thus opening the lay of rope (see Fig 6). Next, with a knife cut out the hemp core about twelve inches on each side. Now straighten the ends and slip them into the place occupied by the core, then twist the clamps back, closing up the rope, taking out any slight inequality with a wooden mallet. Next, shift the clamps and repeat the operation at the other five places, and the splice is made.

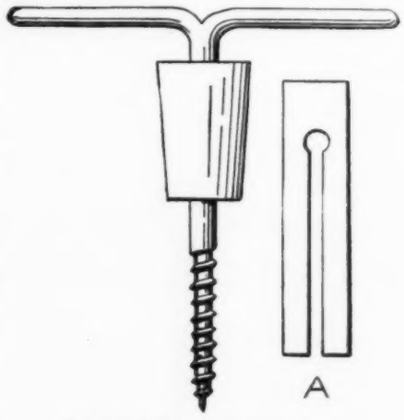
If the rope becomes slack, in time, and runs too loose, a piece can be cut out and the rope tightened up. This will require a piece of rope about 40 feet long, and two splices, one splice to put on the piece of rope, and the other splice to join the two ends together.

[Note: It will well repay our readers to send a 2-cent stamp and get a copy of this book.—Editor.]

HOW TO REMOVE A BROKEN SPOKE.

Take a piece of good iron 7 inches long, 1½ by ½ inch. Punch a hole 2 inches from the end and then cut out to the other end (A). Now open out and swage ends round. Next take a ½-inch coach screw, weld it on one end of an 18-inch piece of ½-inch round iron and weld the other end to the handle. Slip on an old wagon box of good weight and the tool is complete, says a writer in the American Blacksmith.

Now screw your wheel down tight on the wheel horse. If the spoke is not broken off close, saw it off. Bore a 5-16-inch hole in the tennon, take the tool with the box on it, screw in the hole tight. Take the box in hand and strike good, smart blows on the handle of the tool and out comes the tennon. I can clear an old hub is 15 minutes, unless newly spoked with glue. If the spokes look tight, strike a couple of blows with



Tool for Removing Broken Spokes

a heavy hammer on the back of the spoke before sawing off. If the spokes are larger than 2½ inches, use a ⅝-inch coach screw.

HOW TO TEST MERCURY.

Mercury is almost invariably sold pure. If the quicksilver is suspected of being adulterated with lead, tin or bismuth—which is extremely unlikely—such mixture can be shown by rubbing some of the metal on the open palm. If it soils the skin, it is adulterated; if pure, it leaves no trace. If dosed with lead, the drops, instead of being globular, will be elongated and flattened.

HANDY GRINDING AND POLISHING MACHINE.

Of all the many simple and practical machines for saving labor which have appeared recently none seems more sensible than the "Success" grinder. It brings into the small shop a high-speed grinder and polisher without the necessity of having any other power than that

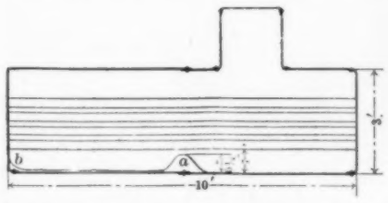
"Success" Grinder.

furnished by the operator himself. It will grind anything without removing the temper, and assorted carborundum wheels are included for different grades of work, as well as polishing wheels, felt wheels, buffers and polishing compound. Luther Bros., of Milwaukee, the manufacturers, will send the machine on trial to those of our readers who will write and satisfy the firm as to their responsibility. It is an inexpensive machine, will pay for itself in a few weeks and will last twenty-five years. It will grind a heavy iron casting or polish a watch case.

MUD IN BOILERS.

Deposits of mud on fusible plugs in boilers are due to the fact that as the water circulates it carries with it small particles of mud, etc., some of which coming in contact with the plug are retained by it.

The drawing shows an instance of this



kind that came under the observation of a correspondent to Power. The mud was retained on the row of rivets around the middle of the boiler and was 5½ inches high, just 1½ inches below the flues and clear across the boiler, as at a. There was some lodged at b also, and was about ¼ inch thick on the back sheet between a and b, while the front sheet over the fire was practically clean. Although the total amount of mud was not excessive, it was piled up in a way that did not look very healthy for the boiler or attendant.

MACHINE CUT WOOD GEAR PATTERNS.

Those of our readers who are building experimental machinery and getting out patterns for the foundry will be glad to learn of a new process by which the wood gear patterns can be made by machinery, and more accurately than can be done by hand. The saving in expense will be evident. The Chicago Pattern Works have the process, which is the only one of its kind in the west thus produced, is absolutely true and can be delivered much quicker than when made in the old way.

BURNING SCREENINGS.

Coal, in many manufacturing plants and in power houses, is a bugbear to the manager because he realizes the small percentage of heat units utilized and because the coal is costing more and more each year, says the Economist.

Any furnace may be arranged for burning screenings and waste at small cost; the coal bill can be cut about 50 per cent.

Get grate bars flat on top, ridges on under side and with the narrow openings between bars. Drill all the three-eighth-inch holes through the bars that you can—about three inches apart each way.

Arrange for forced draught by making fire doors tight and putting blower where hot air should be delivered in ash pit from under the ash doors and through pipe with row of holes so the air may be well distributed.

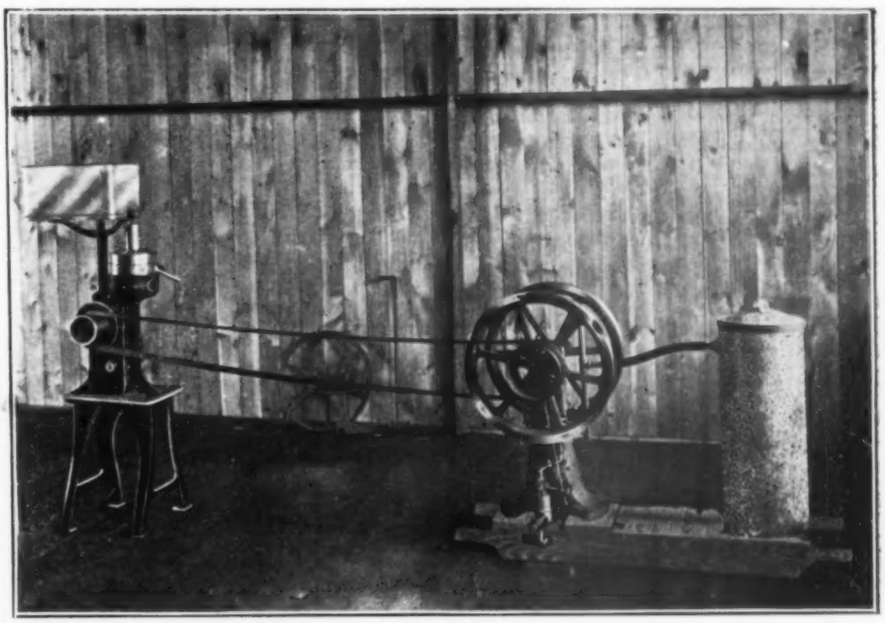
Wet the fuel—this holds the fine particles together until they are past carrying into the stack; feed often and in small amounts.

MECHANICS ON THE FARM.—PART I.

The Gas Engine as a Portable Power Plant

The modern farmer has to be a good deal of a meechanic; at least he should have a fair knowledge of how machinery operates, and, if possible, sufficient knowledge to make the small repairs. By so doing he can save time and money. Nearly all his heavy work can now be done by machinery; the field work with horses and the inside and yard work with power. The gas engine has proven one of the greatest blessings to the farmer since the invention of the self-binder. Its ease of operation, small expense to run, and freedom from sparks which the steam engine scatters right and left, make the gas engine a great labor saver on a farm. With it the farmer can pump water, run saws, grindstones, cornshellers, fanning mills, thresh, churn, and in fact do a multitude of things without extra help. Now that the modern gas engine has been made so simple that a twelve-year-old boy can start it, and it will run for hours without any attention whatever, it becomes one of the necessary things on a large farm. If any of the boys are electrically inclined, they can easily study simple directions and run a set of wires about the house and barn, and have electric light at night, after the gas engine has done other work all day.

One of the latest novel features in connection with gas engines, and a very practical idea as well, has been brought out by Cavanaugh & Darley, Chicago. They are building gas engines of one-horse-power up, and mounting the smaller ones securely on a wooden frame with four handles. By this arrangement the "power plant" can be picked up and carried wherever it may be needed for an hour or more. Perhaps the first work would be to pump up the tank; this done it is taken to the dairy and set to churning, and after this there is wood sawing, or screening, or some other work best



Operating a Cream Separator.

Dyke 1903

No. 8 Auto Supply Catalogue

is the LARGEST in the world. 1,400 illustrations. Send 10c. to cover postage. Dealers free.

Castings and Drawings. 8 sizes of engines. Every thing in the Auto line.

CHANNELLENE GRAPHITE OILS

Engineers write us, it will pay you.

New invention, saves big money. Investigate!

MONARCH MFG. CO.
COUNCIL BLUFFS, IA.
TOLEDO, OHIO

Motor Cycle Engine Castings $7.50

Write us for our latest special offer.

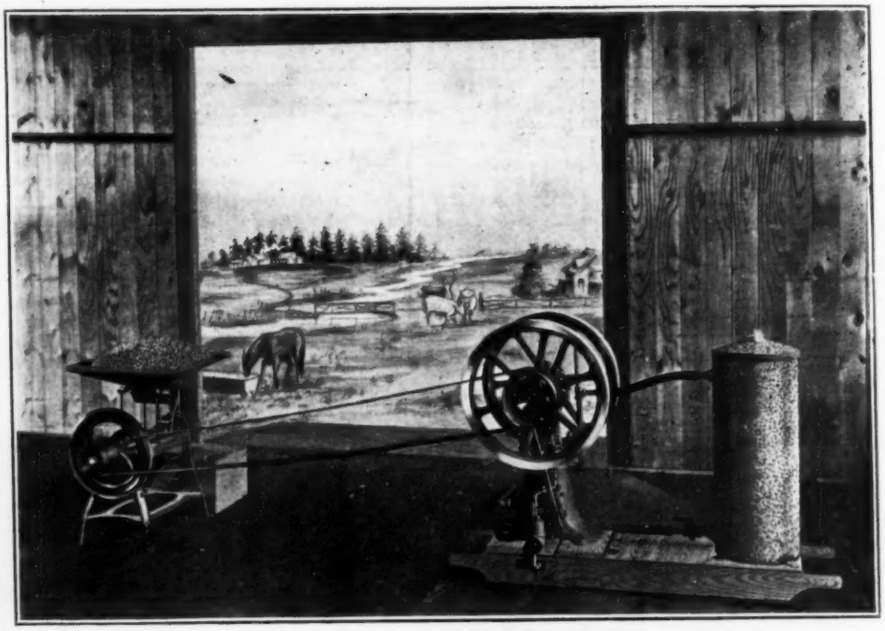
FINISHED MOTORS AND ACCESSORIES

GRAVES MOTOR MFG. CO., St. Paul, Minn.

THE ONLY ORIGINAL
"ALLIER" Whitewashing Machine

Works like magic; will do the work of ten men. Just the thing for spraying fruit trees, berry bushes, vines, plants, shrubs, etc. Agents earn big money. We pay well for a part of the time of reliable men. Now is the best time of year.

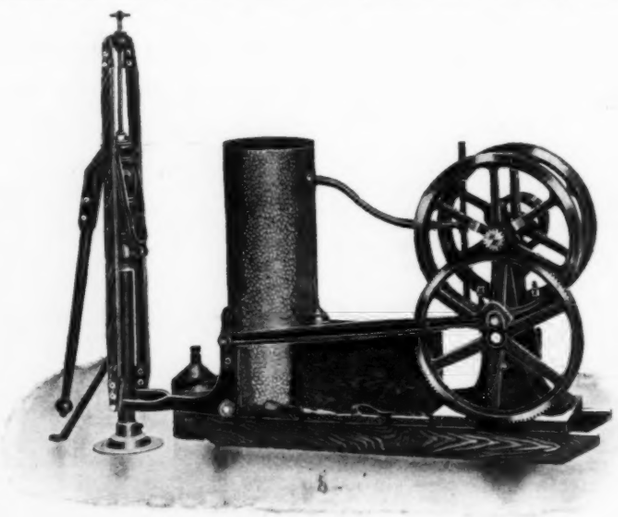
MANUFACTURED SOLELY BY
Chas. L. Bastian Mfg. Co.
BRASS FOUNDERS AND FINISHERS
76-82 ILLINOIS STREET, CHICAGO
Estimates furnished on BRASS CASTINGS of every description .. .. Mention Popular Mechanics



Grinding Corn in an Illinois Barn.

done with power, and when there is nothing else to do it can pump some more water. The larger sizes up to 60-horsepower, of course are heavy and if wanted for use in different places should be carried on a wagon. The first cost is not great and a gas engine will very soon pay for itself.

Santos Dumont's newest airship, it is said, will seat fourteen persons. He is to use it for aerial excursions, charging passengers at the rate of 10 cents a pound per trip. Four additional ships are now being built by Dumont, who says he will be ready to come to St. Louis if the proper prizes are offered.



Portable Gasoline Engine.

AUTOMOBILE MATERIAL

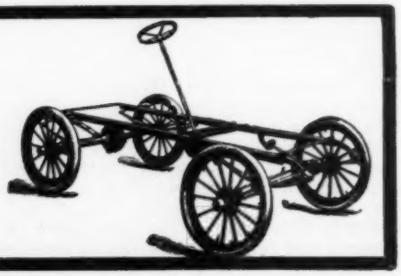
For Building and Repairing all kinds of
Gasoline and Steam Vehicles, Motor Cycles, Etc.

GASOLINE ENGINES FROM 1 1-4 H. P. TO 80 H. P.

Transmission Gears, Running Gears, Wheels, Axles, Differential Gears, Coils, Batteries, and in fact everything necessary for automobiles, also caps, coats and all accessories

SEND FOR 1903 CATALOGUE AND MENTION THIS PAPER.

THE P. J. DASEY COMPANY, - - - 21 La Salle St., Chicago



THE FOUR-TRACK NEWS

An Illustrated Magazine of Travel and Education

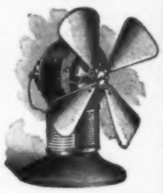
MORE THAN 100 PAGES MONTHLY

Every issue of the magazine is beautifully illustrated and contains one hundred and twenty or more pages, each one of which is of human interest.

The scope and character of the magazine is indicated by each month's Table of Contents which includes a dozen articles upon the Places, Peoples, and Objects of all countries, with Nature-Studies, and other articles upon topics of general value and interest.

SINGLE COPIES 5 CENTS, or 50 CENTS A YEAR
Can be had of newsdealers, or by addressing

GEORGE H. DANIELS, Publisher
Grand Central Station - - New York



KEEP COOL

A 9-in. Electric Fan Motor with batteries and everything complete ready to start $6

Batteries furnish power between 200 and 300 hours of running. Cost $1 to renew. Price $6. Cash with order or $1 with order, balance C. O. D. Money back if not satisfactory.

Agents Wanted.

ACME ELECTRIC CO.
200 So. Clinton St. Chicago, Ill.
Reference: Continental National Bank.

WIRELESS IN COMMERCE.

Lodge-Muirhead System With Novel Coherer Used in England.

The Lodge-Muirhead system of wireless telegraphy has just been launched in commercial form in England. The system is based mainly on the inventions of Sir Oliver Lodge, the apparatus being worked out by him in conjunction with Dr. Muirhead. One of the principal novelties in the system is the use of a new form of coherer in the receiving apparatus. A small steel disc is rapidly rotated with its edge just above the surface of mercury contained in a small cup. A film of oil on the mercury separates the latter from the polished steel, except when the film is momentarily interrupted by "cohering" between the steel and mercury. The rotation of the disc immediately "decoheres" the contact, so that no tapping is necessary. This coherer is said to be absolutely reliable and of great sensitiveness. The system also employs an automatic interrupter to break up the Morse dots and dashes as sent by an ordinary transmitter into a rapid succession of electric impulses. Sending and receiving circuits are closed circuits connected with the actual station wires by transformer coils. This arrangement, which is widely used, is said to be original with Lodge, and covered by his patents.

The darkest hour in the life of any young man is when he sits down to study how to get money without honestly earning it.—Horace Greely.

Popular Mechanics is the American weekly that is written so you can understand it.

HANK MEEKIN'S PLAN.

Hank Meekins sez, sez 'e,
"Jings! I wisht 'at I wuz free
An' did n't hev so awful much
On my mind, an' did n't hev such
Business cares to make me fret."
Hank Meekins sez, sez 'e, "You bet
I'd specerlate, an' push a thing
I got in mind 'at 'is sure to bring
Ten thousand plunks inside a year"
He sez, sez 'e, "but prop'ty intrusts keeps me here."

Hank Meekins sez, sez 'e,
"Right here 's what 's botherin' me.
If I wuz young an' cud git away,
Like you young bucks kin an' stay,
I'd go right down to Arkansaw,
In the bottoms whar the country's raw,
An' grass grows high the hull year through.
An' I'd take erlong a hundred er two
Ev geese, an' whut did n't die,"
He sez, sez 'e, "wud multiply."

An' Hank he sez, sez 'e,
"Each goose wud evridge up yer se
A pound of feathers more er less,
An' each wud evridge up ter dress
Five pounds the goose, an' you cud crate
'Bout half the aigs, an' fer an estimate
Each aig wud hatch a goose," sez 'e.
"You've made yer shipments ez case may be,
An' that's clean cash, an' a good supply
Of geese on hand ter multiply."

Hank Meekins sez, sez 'e,
"It's just like three times three times three,
Yer've got yer lands an' ther aint no rents,
An' yer grass is free and ther's no expense.
But my wife's workin' out by the month," sez 'e,
"An' it sorter throws home cares on me;
But if I wuz young an' cud git away,"
He sez, sez 'e, "I'd start to-day."

—American Thresherman.

TO BALANCE A PLATE ON A NEEDLE POINT.

Balancing a china plate on the point of a needle is not a difficult task when you know how and, furthermore, it is easy to make the plate spin round on the needle's point if properly balanced. But two corks down the middle and in the ends of the four halves thus obtained insert forms, inclined to the smooth sides

Plate and Fork Trick.

of the corks at a little less than right angles. Place these four corks, as in the illustration, around the rim of the plate at equal distances from one another and see that the teeth of the forks are in contact with the rim, to prevent them from swaying.

With a little care this plate can now be balanced on the point of a needle whose eye has been buried in the cork of an upright bottle. By giving it a gentle rotary motion the plate can be made to spin around which it will do for quite a long time.

Mr. Newrocks: What sort of folks are the Bluebloods next door, Mariah? Mrs. Newrocks (patronizingly): Pleasant; but they must be frightfully hard up. They haven't got any mechanical attachment for their piano and have to play it by hand.—Judge.

Colors and Specifications

A new folder illustrating notable steel structures, with practical specifications for painting steel and iron.

Published for free distribution by the

Joseph Dixon Crucible Company
JERSEY CITY, U. S. A.

Store Telephones

Saves Time and time is money. It puts the Manager's office in communication with the heads of all departments.

Send for flier 5m giving description and prices.

The Holtzer-Cabot Electric Co.
295-297 Dearborn Street, CHICAGO
Home Office and Factory, Boston (Brookline) Mass. New York Office 140 Liberty Street

U. S. PATENT OFFICE
Register No. 5187.

RICHARD J. JACKER, solicitor of U. S. and Foreign patents. Mechanical expert. Established 1892.

Send stamp for Aluminum Calendar.

901 Monadnock Block, Chicago

Rupture=Varicocele=Hydrocele
RESULTING NERVOUS DISEASES

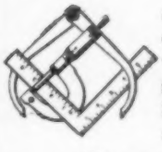
New discoveries regarding their scientific treatment are described and illustrated. The book is sent sealed for ten cents.

D. D. RICHARDSON, M. D.
SUITE 636 123 MICHIGAN AVE., CHICAGO

PATENTS

PROTECT YOUR IDEAS.
Consultation Free.
Fee Dependent on Success.
Established 1864
MILO B. STEVENS & CO.
885 14th St. Washington, D. C

Starrett Tools



are the standard for accuracy, design, finish and workmanship. A necessity to the mechanic, a luxury to the amateur, a delight to both.

176 page Catalogue free.
Ask for Catalogue No 17 AP.

THE L. S. STARRETT CO.
ATHOL, MASS., U. S. A.

There are now as many systems of wireless telegraphy as there are brands of antifats.—Four Track News.

The Plant That Grows Buttons

Editor Popular Mechanics:—Would it be possible for you to publish a picture of the Tagua palm of Central America, the nut of which is used in the manufacture of buttons in the United States, as described in your recent issue. From the description you give I am of the opinion that this plant can be found in Louisiana and Texas.—J. R. L., San Antonia, Texas.

The accompanying illustration is a good likeness of the Tagua palm or Ivory plant of Central America, found principally in Colombia and Equador. The nuts after drying are transported to the United States in ship loads and here manufactured into buttons. A species of the plant has been found in California. It grows in damp, sandy loam localities, and sometimes at considerable elevation above the sea. It is mostly found in separate groves, not mixed with other trees or shrubs and where even herbs are rarely met with, the ground appearing as if it had been swept. It is a stemless, palm-like plant, the top of which is crowned with from 12 to 20 very long feather-like leaves, reaching as high as 15 to 20 feet. The fruit consists of a conglomerated head, composed of 6 or 7 drupes, each containing from 6 to 9 seeds, the whole being inclosed in a walled, woody covering, forming altogether a globular head about twice the size of a man's head.

The Apparel Gazette says: "A single plant sometimes bears from 6 to 8 of these large heads of fruit, each weighing from 20 to 25 pounds. Each of these heads or clusters of bulbs contains from 50 to 60 seeds,—the ivory nuts proper,—each pod containing about three nuts. In its very young stage the seed contains a clear, insipid fluid which travelers take advantage of to allay thirst. As it becomes older this fluid becomes milk and of a sweet taste, and it gradually continues to change, both in taste and substance, until it becomes so hard as to make it valuable as a substitute for animal ivory.

Tagua Palm, or Ivory Plant of Central America.

NEW MEXICAN CANAL.

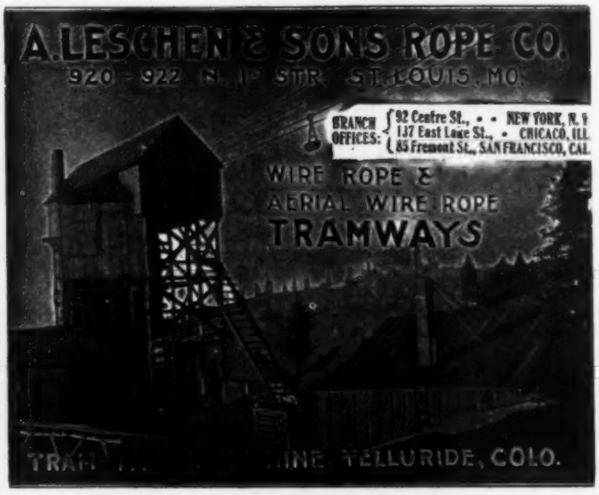
The government of Mexico is constructing a canal between Tampico and Tuxpam, or more correctly speaking, widening and deepening the existing canal. The work is in the hands of Americans, and is undertaken on a percentage basis. It goes through a rich country, and will prove an important feeder to the commerce of Tampico. The journey, which now takes four or five days in canoes, will be accomplished in steamers in about twelve hours.

SLEEPING CARS ON TROLLEY LINES.

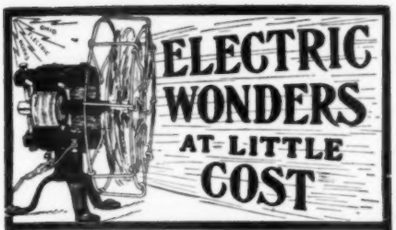
New Innovation on the Interurban Road Between Indianapolis and Columbus.

Two sleeping cars are to be put in service on the electric road between Indianapolis, Ind., and Columbus, Ohio, by the Indianapolis and Eastern Company. The cars, which were built at the Harlan and Hollingsworth shops at Wilmington, Del., at a cost of $38,000 for the two, contain 20 berths each, or 10 compartments. They will be heated and lighted by electricity and are among the first of the kind ever built in this country. The Western Electrician says: The cars are geared to run at a speed of 60 miles an hour, if desired. By the introduction of the cars a considerable saving is effected in the expense of travel from Indianapolis to Columbus. The price will be $2 a berth or $3 for a compartment. This, with the usual interurban fare, which is about half that of the steam roads, will make the sleeper service somewhat cheaper than the steam roads' regular day service.

Italy has a fleet of 335 vessels of various kinds, having a combined tonnage of 387,177 tons. In process of construction are two battleships of the first class, one armored cruiser and five torpedo boats.


A. LESCHEN & SONS ROPE CO.
920-922 N. 1ST STR. ST. LOUIS, MO.
BRANCH OFFICES:
92 Centre St., • • NEW YORK, N. Y.
137 East Lake St., • CHICAGO, ILL.
85 Fremont St., SAN FRANCISCO, CAL.
WIRE ROPE &
AERIAL WIRE ROPE
TRAMWAYS
TELLURIDE, COLO.

Please mention Popular Mechanics



ELECTRIC WONDERS AT LITTLE COST

Electric Fan Motor with Battery	$5.95
Electric Table Lamp with Battery	3.00
Battery Hanging Lamp	10.00
Telephone, with Battery complete	5.95
Electric Door Bells, all connections	1.00
Electric Carriage Lamp	5.00
Electric Hand Lanterns	2.00
$8.00 Electrical Medical Batteries	3.95
$12.00 Belt, with Suspensory	2.50
Telegraph Outfits, complete	2.25
Battery Motors from $1.00 to	12.00
$6.00 Bicycle Electric Lights	2.75
Electric Railway	3.50
Pocket Flash Lights	1.50
Necktie Lights 75c. to	3.00

Send for Free Book. Describes and illustrates many of the most useful electric devices, at wonderfully small prices. All practical. The lowest price in the world on everything electrical. Agents can make handsome commissions and many sales. Write for complete information.

OHIO ELECTRIC WORKS, Cleveland, Ohio.

Please mention Popular Mechanics

Engineer's License

Mechanics, Electricians
Engineers, Firemen, Etc.

40-page pamphlet containing questions asked by Examining Board of Engineers

SENT FREE!

GEORGE A. ZELLER, Publisher
19 So. Fourth Street, St. Louis, Mo.

New 96-page Catalogue sent on receipt of 4c. in stamps.

COLORADO

The delightful country of health-giving, dry air and inspiring scenery is the ideal place for a

Summer Vacation

A country perfectly suited for rest, recreation or sport, abounding in good hotels and boarding places adapted to any man's means. Excursion tickets will be sold at very low rates. Only one night en route from Chicago.

Chicago, Union Pacific and North-Western Line

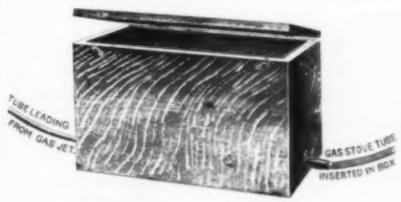
Illustrated booklets on application at your nearest ticket agent or address

W. B. KNISKERN,
Passenger Traffic Manager C. & N.-W. RY.,
CB2 22 Fifth Ave., CHICAGO.

GAS BOX FOR KILLING CATS.

All Kinds of Domestic Animals Humanely Destroyed in Newly Invented Device.

A box designed for the purpose of humanely killing cats, dogs, rabbits, rats, birds, etc., by means of asphyxiation has been invented by G. Foster Howell of Brooklyn. It only costs 2 cents to destroy a box full of cats by the Howell method,



Box for Asphyxiating Cats.

and the time required is less than 30 seconds. The box is air tight and is provided with two inlets on the ends for admitting illuminating gas through rubber hose. The inventor declares this the quickest and most humane method of putting small animals to death known to modern science.

DEMONSTRATES OZONE PROCESS.

French Scientist Shows New System of Purifying Water.

Prof. Otto, of France, recently made a successful demonstration at Niagara Falls of the ozone process of purifying water. An electric current of 50,000 volts was sent through a cylinder ozonizer through which air passed, and as the air met the electrical discharges the oxygen was burned, creating ozone. This ozone was carried to the sterilizing tower by two pipes. The unpurified water entered the tower at the top, and there, in spray form, first met the ozone. As it flowed downward through fine granite it again met the ozone, completing the process. The water product was clear and quite changed. It is stated that from thirty to forty electrical horse power will treat 6,000 tons of water a day.

PASSING OF THE SAILING VESSEL ON THE LAKES.

Not in the recollection of some of the oldest lake navigators has a season afforded so little opportunity for sailing vessels to make a living as the present one. With the season for these craft nearly half over, there are yet in the neighborhood of half a dozen schooners in port that have not made their initial trip. The owners of some of them have refused to fit out the boats on the ground that such freights as can be procured will net no profit. Owners who have made trips verify this, and not a few have expressed intention of going to the docks unless there is some improvement very soon.

Sailing vessels for general use in the lake trade have become an obsolete means of transportation. The reduction of the once large fleet of several hundred vessels hailing from Chicago has been remarkable. At the present time there are scarcely more than thirty-five of these boats actually trading in Chicago.

When you want anything, just try a Popular Mechanics want ad.

STEELO

HARDENS AND TOUGHENS IRON, IMPROVES STEEL AND PREVENTS RUST

STEELO COMPANY, 403 EAST 23d ST NEW YORK U. S. A

OUR ROTARY MEASURE

The fastest all-around measure made. Measures curves of any kind as easily as straight work. Accurate, carried in the vest pocket, lasts a life time. As simple as a rule. In fact, so simple anyone can use it. Praised by all who know its merits as an ideal measure for the factory, office or home. Says one: "I would not be without it for $50." Write today for free illust'd circular.

Steckenreiter Mfg. Co.
102 Lake St., Chicago, Ill

JUST WHAT EVERY YOUNG ELECTRICIAN WANTS.

THE MODEL DYNAMO-MOTOR.

Will Decompose Water, Do Electro Plating, Light Incandescent Lamps, Run Machinery, etc.

☞ Send 2c. stamp for illustrated catalogue.

Elbridge Electrical Mfg. Co., Elbridge, N. Y., U. S. A.

METAL PARTS

for any machine or device manufactured to order in any quantity. Models, Mechanical or Electrical, made from your drawings.

Best facilities, prompt service, terms reasonable.

SPIES ELECTRIC CO.
91 W. Van Buren St., Chicago

WOOD or METAL Workers

Without Steam Power should use our Foot and Hand Power Machinery. Send for Catalogues A—Wood-working Machinery, B—Lathes, etc.

SENECA FALLS MFG. CO.
102 Water St., Seneca Falls, N.Y.

A SAMPLE SUSPENSORY

Same as retails for $1.00 will be sent postpaid for 25 cents. We are manufacturers and only give this $1.00 value suspensory to you for introduction. Your druggist will supply you at regular prices.

Celso Chemical Co., Suite 511 123 Michigan Ave., Chicago

TYPEWRITERS ALL MAKES

All the Standard Machines Sold or Rented Anywhere at Half Manufacturers Prices. Shipped with privilege of examination. Send for cata'g Typewriter Emporium, 196 La Salle St., Chicago

CYRUS W. RICE
PATENT LAWYER

Prompt and Careful Attention to Soliciting Patents
1211 Ashland Block, CHICAGO
Bank References. Branch Offices: Washington, D. C.

ZAMBESI GEM.—Great Discovery, Experts can not detect it from genuine diamond. Costs but one-tenth. In brilliancy and cut it has no equal. Setting solid gold. Write for illustrated catalogue. ROWE & CO., Dept. X, 356 Dearborn St., Chicago, Ill.

10 VOLT, 1-8 H. P.
Battery Motors
$5.00 EACH
WALSH'S SONS & COMPANY
250 Washington St., Newark, N. J.

MANHATTAN POLARITY INDICATOR

The Newest and Best Indicator Made for BATTERY OR DYNAMO CURRENT

PRICE 75 CENTS EACH

Catalogue No. 16 (just out) describes it and hundreds of other Novelties. Mailed on application

MANHATTAN ELECTRICAL SUPPLY CO.

32 Cortlandt St., NEW YORK 186-188 Fifth Ave., CHICAGO

Only Original Imported
ORIENTAL CHARM

BRINGS GOOD LUCK TO THE WEARER

While entirely new in this country it is selling so fast among girls and women of refined tastes that we find it almost impossible to keep up with the demand. The design is most artistic and the Charm is in the form of a locket gold-dipped and is intended to be worn either with chain around the neck or in bosom. This Charm is so powerful and fragrant it destroys all the disagreeable odor of perspiration. There is nothing that will fascinate men more quickly than for ladies to have some indescribably alluring aroma. The Oriental Charm is all this and more. We consider it the finest, neatest and most mysterious little novelty imported to this country in years. We will send one securely packed in plain wrapper on receipt of Price, 25c.; or 5 for $1.00.

LOS GATOS NOVELTY COMPANY

603 Journal Building, Chicago

CRANE VALVES

ESTABLISHED 1855

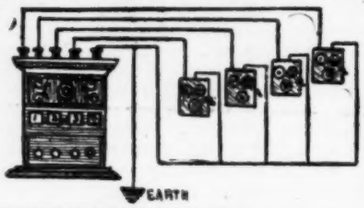
FARR TELEPHONE & CONSTRUCTON SUPPLY CO.

118 & 120 W. Jackson Boul.

CHICAGO, ILL.

Guaranteed Telephones For Everybody

WE WANT YOUR ORDER



HIGH GRADE TELEPHONES AND TELEPHONE SUPPLIES

Telephones for Short Private Lines $2.75 to $6.00 Each.
Telephones for Buildings and Factories $2.75 to $8.00 Each.
Telephones for Exchanges and Toll Lines $5.25 to $14.00 Each.
Batteries, Wire, Cross Arms, Pins, Glass Insulators Guaranteed.

SEND FOR CATALOG B, NO. 16. SENT FREE

OUR GASOLINE ENGINES

1 to 60 H. P.,

Are so simple and perfect in construction that a boy can start them Monday morning and they will run right on by themselves for a whole week, night and day, without another touch or any attention whatever. Do not get out of order. Cost only a few cents a day. No sparks or danger from fire. Just the thing for cheap power for Machine shops or Residence, Electric Light Plants, etc. We have them portable by hand or mounted on wheels for any kind of work on the farm, sawing wood, pumping, etc. We also carry all sizes Gasoline Marine and Automobile Engines. Write for catalog and price.

Cavanaugh & Darley

25 West Randolph St. CHICAGO

"Want" and "For Sale" Ads. 2 cents per word, payable in advance. Replies may be sent to a number, care Popular Mechanics, and will be forwarded promptly without extra charge.

FOR SALE.

THREE AUTOMOBILE Running Gears at bargain figures; ready for power. C. A. Coey & Co., 5311 Cottage Grove Ave., Chicago.

FOR SALE—County seat harness shop, near Yosemite Valley and Big Trees. Fine trade with cowboys, teamsters and ranchers. Reason for selling, have other business. S. A. Hansen, Mt. Bullion, Calif.

TWO REAL BARGAINS—A fine Mobile $295, worth $500; Murray Car $395, worth $550. C. A. Coey & Co., 5311 Cottage Grove Ave., Chicago.

SPARK PLUG FREE with every set of castings sold this month, 1 1-4 H. $8.00, 2 1-2 H. $12.00, 3 H. $15.00, complete with cut gears, bronze connecting rod and bearings, also two sheets of blue prints. S. H. 2 1-2 H. Bicycle Motor with Spark Plug $30.00, guaranteed in first-class shape. W. Hoffman Motor Works, 1253 N. Halsted St., Chicago.

WRITE US YOUR WANTS if in need of power, we build Boilers, Pumps, Steam, Gas and Gasoline Engines from ⅛ H. P. up. Martin Mfg. Co., 180 W. Madison St., Chicago, Ill.

FOR SALE CHEAP—Scientific and Plain Tool Tempering to a standard with Toy's Colored Charts A and B in Oil, Water or Tallow and a New Treatise on all the New Steels made, with 75 New Methods for Forging, Welding and Self-Hardening with ten Welding Compounds for same. Also Thermite Welding explained and welding compound to weld same. All the above for one dollar. Samples free. Forty years a factory steel worker. W. M. Toy, Sidney, Ohio.

WANTED.

WANTED—Mechanics to know that our "Sure Grip" Tool Handle is the best adjustable handle made. Sample in wood ten cents. Steel twenty cents, or two for a quarter. Send for samples. J. C. Lambert Company, Tonica, Ill.

HELP WANTED.

WANTED—A good tinner; one that can do inside and outside work. Chas. Wolf, 306 South Main St., Mt. Vernon, Ohio.

CHARTERS.

INCORPORATE YOUR BUSINESS—Charters procured under South Dakota laws for a few dollars. Write for corporation laws, blanks, bylaws and forms, free, to Philip Lawrence, late Assistant Secretary of State, Huron, Beadle Co., South Dakota.

AUTOMOBILES.

FOR SALE—Conrad steam Dos-a-Dos; elegant condition; $475; photo. A. R. Wells, 114 Bowery St., Akron, Ohio.

SEVERAL SECOND-HAND AUTOS, $350 to $1,000. Also several odd motors at low prices. Duryea Power Co., B Street, Reading, Pa.

MISCELLANEOUS.

LET ME SELL YOUR PATENT. I HAVE BUYERS WAITING. CHARLES A. SCOTT, GRANITE BLDG., ROCHESTER, N. Y.

AGENTS WANTED. — The Enterprise Pocket Fire Escape; price $2 by mail prepaid. The most complete and safest fire escape ever invented. The renowned life saver of the 20th century. Address Enterprise Harness Works, 451 Aliso St., Los Angeles, Cal.

STOCK COMPANIES INCORPORATED AND FINANCED. NEW YORK CORRESPONDENTS. CHARLES A. SCOTT, ROCHESTER, N. Y.

SPECIALTY MANUFACTURING.

IF YOU WANT any Automatic or Experimental Machinery designed or built write us your wants. Martin Bros., 5563 Shields Ave., Chicago.

MANUFACTURERS OF PATENT ARTICLES, dies, metal stamping, screw machine work, hardware specialties, special machinery and tools. Quadriga Manufacturing Company, 18 South Canal St., Chicago.